
**Lake Thunderbird TMDL Monitoring Plan Implementation:
Sample Year (SY) 2018- October Report**



SY2018 Monthly Report

Lake Thunderbird TMDL Monitoring Plan Implementation:

October 2018 Monitoring Report

Oklahoma Water Resources Board
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SUMMARY OF OCTOBER WATER QUALITY SAMPLING

Sampling for October 2018 occurred on the twenty-first of September and was considered a high flow collection. Water samples were collected at twelve locations, including four stormwater outfalls, and discharge was measured at two locations. Mesonet data shows 2.63 inches of precipitation occurring on the twenty-first, no precipitation in the 72 hours prior to sampling, and 0.09 inches of precipitation in the 72 hours after the sampling event. The total rainfall amount in Norman for the month of October was 5.18 inches. All water level gauges were operational for the month, with the exception of CC-1 as a result of road construction activity, and LT-1 due to equipment malfunction.

RESULTS

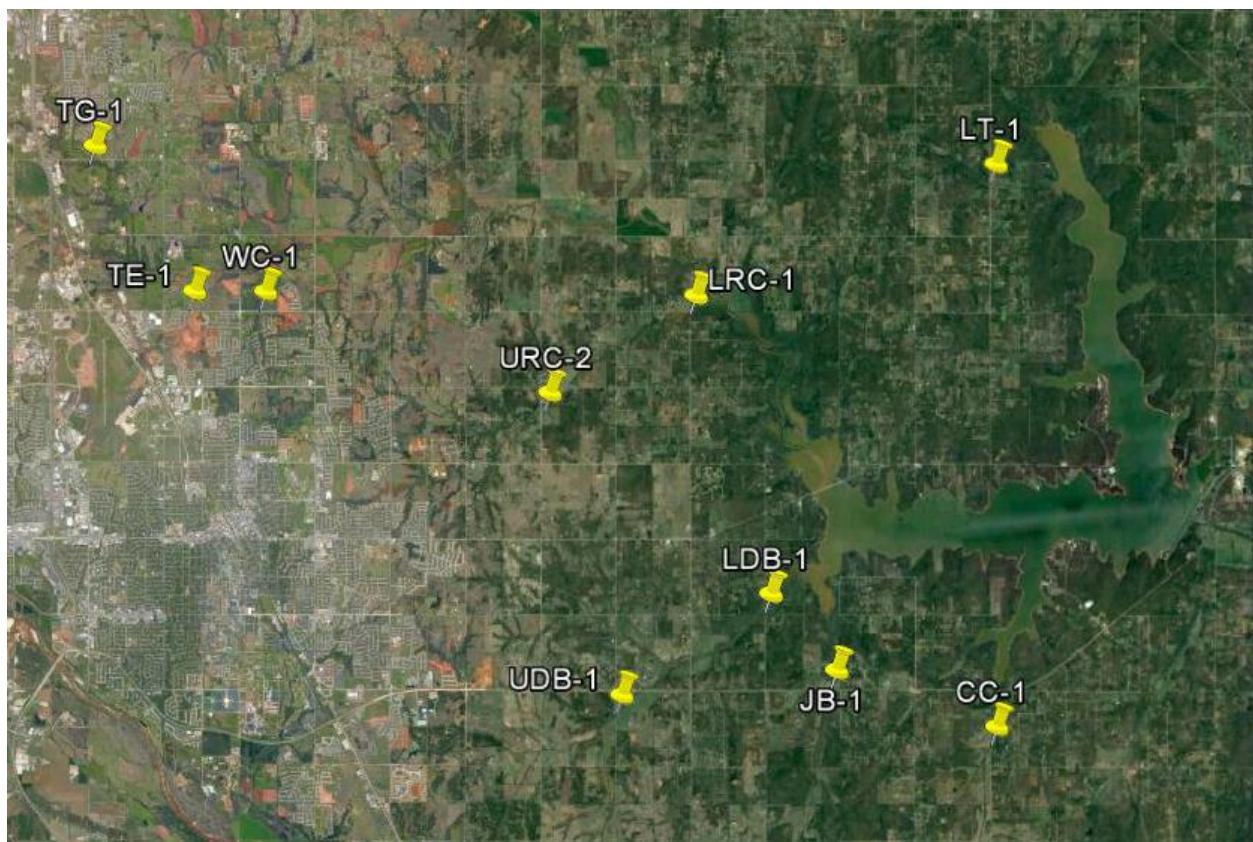


Figure 1 Monitoring Station Map

Field Data Form

Field Measurement Record

Reviewed By: _____ JM _____

Station	Date	Time	Field Crew	Temp C°	DO mg/L	SpC µS	pH	Turb (NTU)	Notes
cc-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not sampled
lt-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not sampled
jb-1	9/21/2018	19:15	SD	N/A*	N/A*	222.0	N/A	326.0	autosampler collected T4 at 18.77, peak at 19.35 at 20:00
udb-1	9/21/2018	15:30	SD	N/A*	N/A*	146.0	N/A	1000.0	autosampler collected T4 at 21.58, peak at 25.28 at 17:30. Discharge estimated from rating curve, seems high
ldb-1	9/21/2018	17:15	SD	N/A*	N/A*	128.0	N/A	1000.0	autosampler collected T4 at 20.089, peak at 20.529 at 18:00
tg-1	9/21/2018	16:45	SD	N/A*	N/A*	175.0	N/A	760.0	autosampler collected T3 at 17.24, peak at 17:45 at 18.46
te-1	9/21/2018	15:45	SD	N/A*	N/A*	203.0	N/A	589.0	autosampler collected T2 at 15.11, peak at 15.79 at 17:00
wc-1	9/21/2018	16:15	SD	N/A*	N/A*	136.0	N/A	478.0	autosampler collected T4 at 14.02, peak at 14.77 at 16:45. Rating curve discharge at 38cfs, seems low . Estimated flow from 9/21/18 measurement
lrc-1	9/21/2018	17:20	SD	N/A*	N/A*	206.0	N/A	1000.0	autosampler collected T4 at 22.43, peak at 25.26 at 18:45
urc-2	9/21/2018	15:45	SD	N/A*	N/A*	128.0	N/A	790.0	autosampler collected T3 at 15.96, peak at 20.26 at 17:30
sw-02	9/21/2018	14:50	JM	23.2	7.9	100.0	N/A	263.0	collected at current peak, still rising
sw-03	9/21/2018	14:40	JM	23.0	7.7	142.0	N/A	161.0	collected from stream, sampler under water, unaccessible
sw-06	9/21/2018	15:50	JM	23.0	6.0	192.0	N/A	30.0	
sw-07	9/21/2018	15:30	JM	26.1	6.3	197.0	N/A	28.0	

Table 1 Field Data Form Where An Asterisk Denotes A Sample From The Autosampler

Site Name	TKN (mg/L)	Nitrate/Nitrite (mg/L)	TP (mg/L)	TSS (mg/L)
TG-1	2.13	0.22	0.560	1170
CC-1	N/A	N/A	N/A	N/A
JB-1	2.41	0.41	0.413	356
UDB-1	4.14	0.15	0.850	2860
LDB-1	4.92	0.22	1.045	3930
LRC-1	6.08	0.12	1.075	4060
URC-2	2.99	0.14	0.590	1170
WC-1	2.10	0.30	0.545	848
TE-1	1.40	0.23	0.354	304
LT-1	N/A	N/A	N/A	N/A
SW-02	1.55	0.25	0.346	368
SW-03	1.71	0.29	0.460	360
SW-06	0.96	0.13	0.084	12.5
SW-07	0.82	<0.05	0.053	22.0

Table 2 Laboratory Analysis Summary

Site Name	TKN	Nitrate/Nitrite	TP	TSS
Field Blank	<0.10 mg/L	<0.05 mg/L	<0.010 mg/L	<5.0 mg/L

Table 3 QA/QC Data

Quality assurance/quality control (QA/QC) of the data includes a field blank and duplicate sample from each collection event, and is qualified by the OWRB. Relative Percent Difference (RPD) of the duplicate sample can be categorized into four levels, where Level 1 likely has no QA issues and Level 4 has major QA issues, and should be used with caution.

SITE	TG-1	CC-1	JB-1	UDB-1	LDB-1	LRC-1	URC-2	WC-1	TE-1	LT-1
STAGE (ft)	17.24	N/A	18.77	21.58	20.09	22.43	15.96	14.02	15.11	3.595
DISCHARGE (ft ³ /s)	951	N/A	55	871	431	110	95	450	355	N/A

Table 4 Station Discharge Summary

Station Number:
Station Name: te-1

Meas. No: 0
Date: 09/21/2018

Party: scd jtw	Width: 54.1 ft	Processed by:
Boat/Motor:	Area: 172 ft ²	Mean Velocity: 1.80 ft/s
Gage Height: 15.76 ft	G.H.Change: 0.000 ft	Discharge: 309 ft ³ /s
Area Method: Avg. Course	ADCP Depth: 0.270 ft	Index Vel.: 0.00 ft/s Rating No.: 1
Nav. Method: Bottom Track	Shore Ens.:10	Adj.Mean Vel: 0.00 ft/s Qm Rating: U
MagVar Method: None (0.0°)	Bottom Est: Power (0.1667)	Rated Area: 0.000 ft ² Diff.: 0.000%
Depth: Composite (VB)	Top Est: Power (0.1667)	Control1: Unspecified
Discharge Method: None		Control2: Unspecified
% Correction: 0.00		Control3: Unspecified
Screening Thresholds:		ADCP:
BT 3-Beam Solution: YES	Max. Vel.: 9.64 ft/s	Type/Freq.: RiverRay / 0 kHz
WT 3-Beam Solution: YES	Max. Depth: 5.29 ft	Serial #: 645654 Firmware: 44.16
BT Error Vel.: 3.28 ft/s	Mean Depth: 3.17 ft	Bin Size: 50 cm Blank: 50 cm
WT Error Vel.: 32.81 ft/s	% Meas.: 49.31	BT Mode: 0 BT Pings: 1
BT Up Vel.: 32.81 ft/s	Water Temp.: None	WT Mode: 1 WT Pings: 1
WT Up Vel.: 32.81 ft/s	ADCP Temp.: 72.0 °F	WV : 170
Use Weighted Mean Depth: YES		

Performed Diag. Test: NO

Project Name: te0921_0.mmt

Performed Moving Bed Test: NO

Software: 2.17

Performed Compass Calibration: NO Evaluation: NO

Meas. Location:

Tr.#	Edge Distance		#Ens.	Discharge						Width	Area	Time		Mean Vel.		% Bad		
	L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins	
000	L	6	8	302	80.5	165	64.0	1.84	6.46	318	57	181	15:46	15:50	0.46	1.75	0	1
001	R	6	8	160	71.6	139	58.9	3.96	10.9	285	53	168	15:50	15:52	0.44	1.69	1	2
002	L	6	8	230	74.3	146	65.0	4.38	12.6	302	52	163	15:52	15:55	0.41	1.85	1	1
003	R	6	8	170	82.2	159	71.2	7.27	11.5	332	54	173	15:55	15:57	0.52	1.92	2	1
Mean		6	8	215	77.1	152	64.8	4.36	10.4	309	54	172	Total	00:10	0.46	1.80	1	1
SDev		0	0	65	5.02	11.8	5.07	2.24	2.70	20.3	2.3	7.6			0.05	0.10		
SD/M		0.00	0.00	0.30	0.07	0.08	0.08	0.51	0.26	0.07	0.04	0.04			0.10	0.05		

Figure 2 Discharge Summary TE-1

Station Number:
Station Name: wc-1

Meas. No: 0
Date: 09/21/2018

Party: scd jtw	Width: 43.1 ft	Processed by:
Boat/Motor:	Area: 178 ft ²	Mean Velocity: 2.58 ft/s
Gage Height: 13.60 ft	G.H.Change: 0.000 ft	Discharge: 429 ft ³ /s
Area Method: Avg. Course	ADCP Depth: 0.270 ft	Index Vel.: 0.00 ft/s Rating No.: 1
Nav. Method: Bottom Track	Shore Ens.:10	Adj.Mean Vel: 0.00 ft/s Qm Rating: U
MagVar Method: None (0.0°)	Bottom Est: Power (0.1667)	Rated Area: 0.000 ft ² Diff.: 0.000%
Depth: Composite (VB)	Top Est: Power (0.1667)	Control1: Unspecified
Discharge Method: None		Control2: Unspecified
% Correction: 0.00		Control3: Unspecified
Screening Thresholds:		ADCP:
BT 3-Beam Solution: YES	Max. Vel.: 6.55 ft/s	Type/Freq.: RiverRay / 0 kHz
WT 3-Beam Solution: YES	Max. Depth: 7.01 ft	Serial #: 645654 Firmware: 44.16
BT Error Vel.: 0.33 ft/s	Mean Depth: 4.08 ft	Bin Size: 50 cm Blank: 25 cm
WT Error Vel.: 32.81 ft/s	% Meas.: 43.07	BT Mode: 5 BT Pings: 1
BT Up Vel.: 1.00 ft/s	Water Temp.: None	WT Mode: 1 WT Pings: 1
WT Up Vel.: 1.64 ft/s	ADCP Temp.: 71.8 °F	WV : 170
Use Weighted Mean Depth: YES		

Performed Diag. Test: NO

Project Name: wc0921_0 edit.mmt

Performed Moving Bed Test: NO

Software: 2.17

Performed Compass Calibration: NO Evaluation: NO

Meas. Location:

Tr.#	Edge Distance		#Ens.	Discharge						Width	Area	Time		Mean Vel.		% Bad		
	L	R		Top	Middle	Bottom	Left	Right	Total			Start	End	Boat	Water	Ens.	Bins	
003	L	5	3	164	107	217	127	23.0	20.6	495	33	141	14:58	15:00	0.57	3.52	70	1
004	R	5	3	208	101	163	126	25.4	20.8	436	41	165	15:00	15:02	0.63	2.64	69	4
006	R	5	3	211	70.3	218	126	24.2	10.5	450	61	292	15:04	15:06	0.60	1.54	70	1
007	L	5	3	165	69.9	155	88.9	26.9	5.44	346	41	147	15:06	15:08	0.68	2.35	67	2
009	L	5	3	175	90.8	171	113	26.7	17.9	419	39	146	15:12	15:14	0.57	2.87	66	1
Mean	5	3	184	87.8	185	116	25.2	15.0	429	43	178	Total	00:15	0.61	2.58	68	2	
SDev	0	0	23	17.1	30.5	16.4	1.65	6.81	54.3	10.8	64.1				0.04	0.73		
SD/M	0.00	0.00	0.13	0.20	0.17	0.14	0.07	0.45	0.13	0.25	0.36				0.07	0.28		

Figure 3 Discharge Summary WC-1

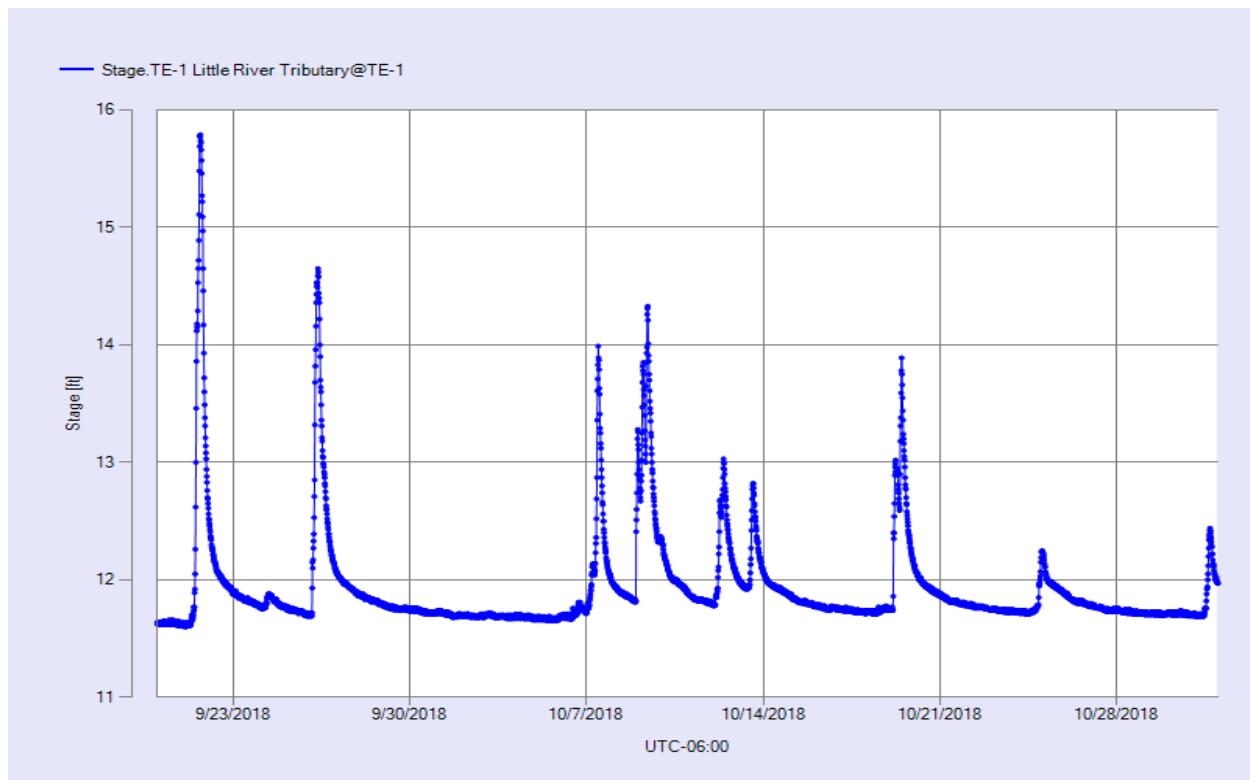


Figure 4 Monthly Hydrograph TE-1

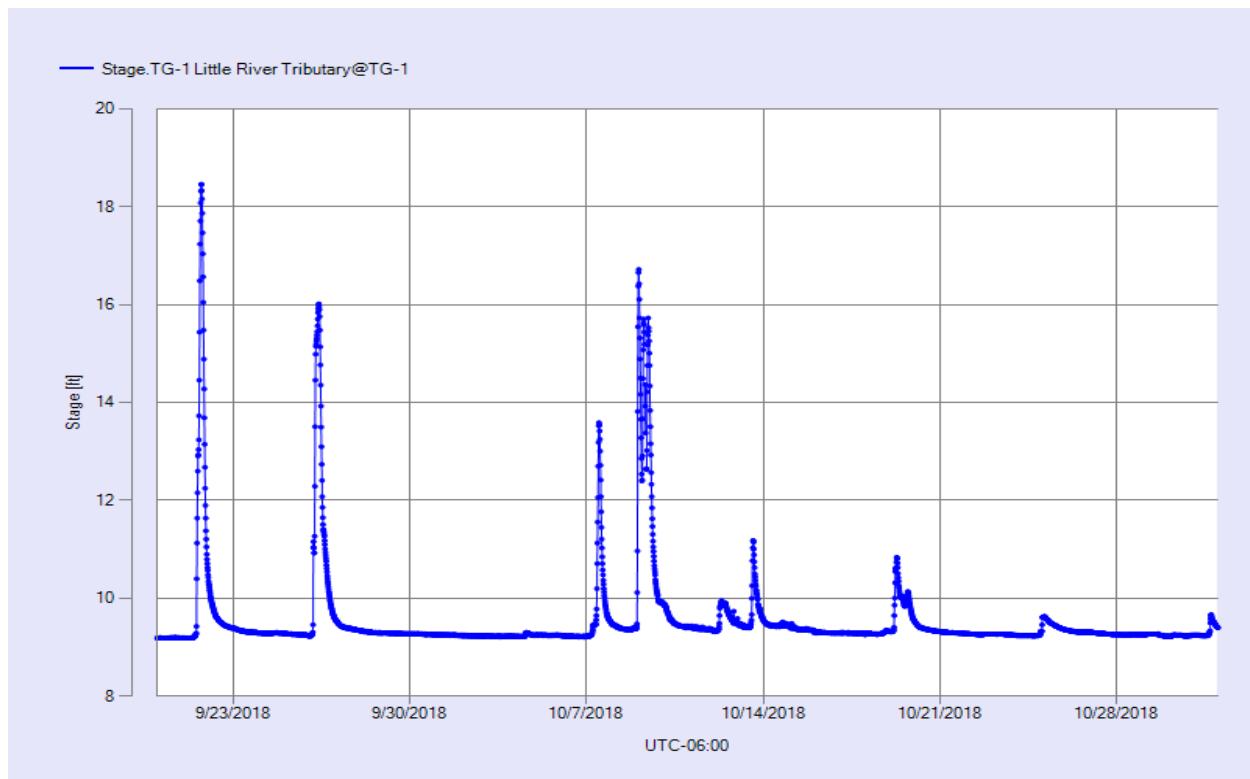


Figure 5 Monthly Hydrograph TG-1

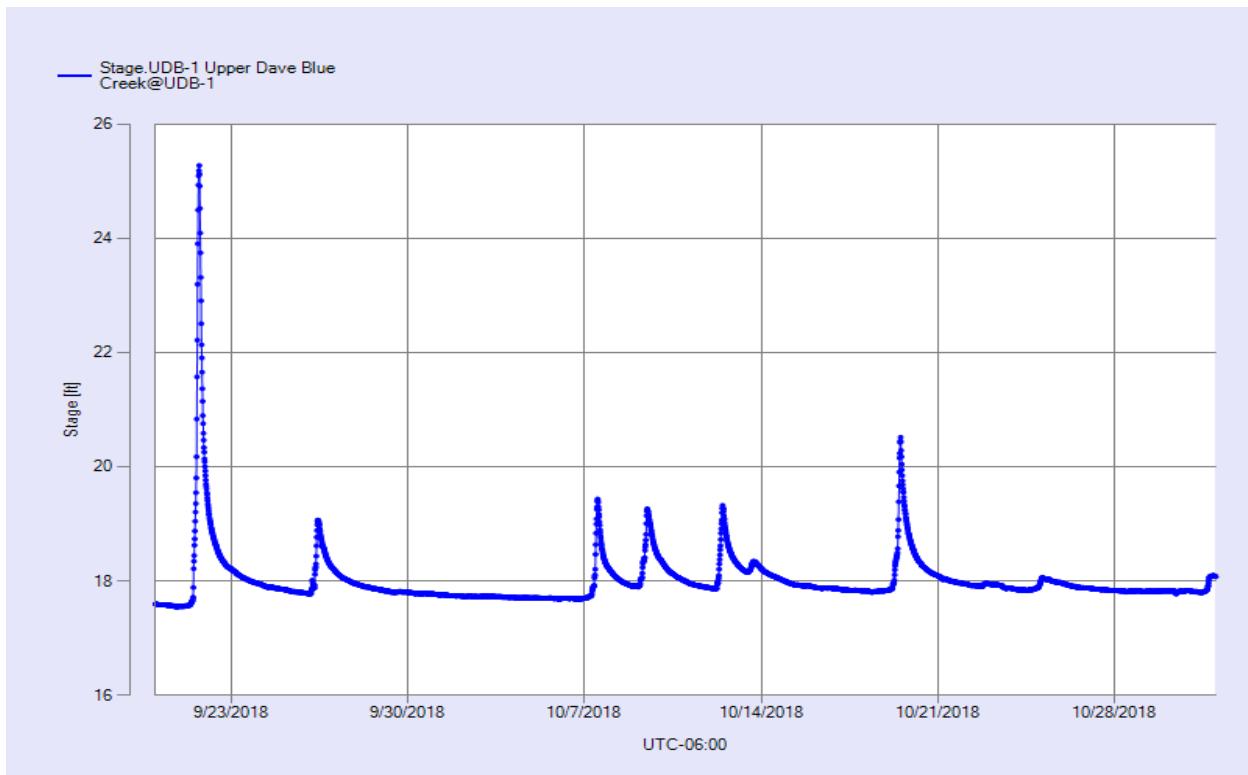


Figure 6 Monthly Hydrograph UDB-1

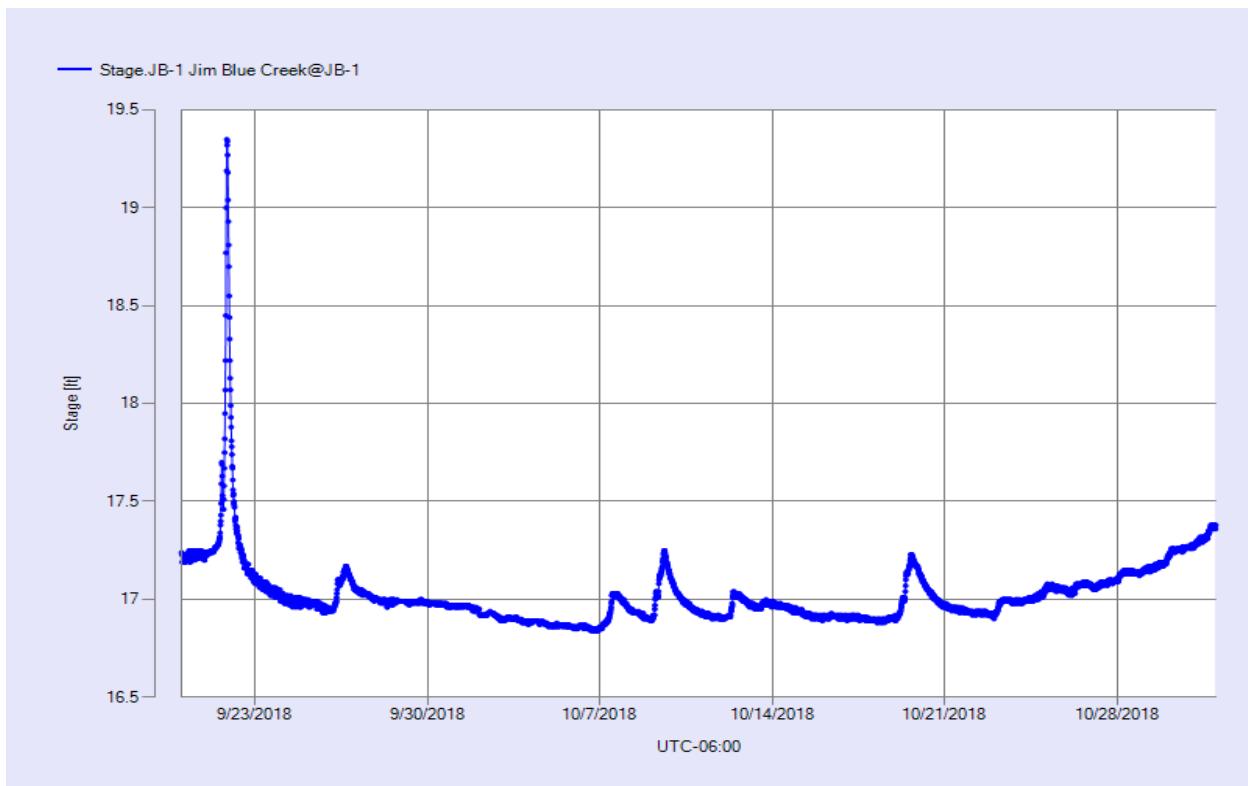


Figure 7 Monthly Hydrograph JB-1

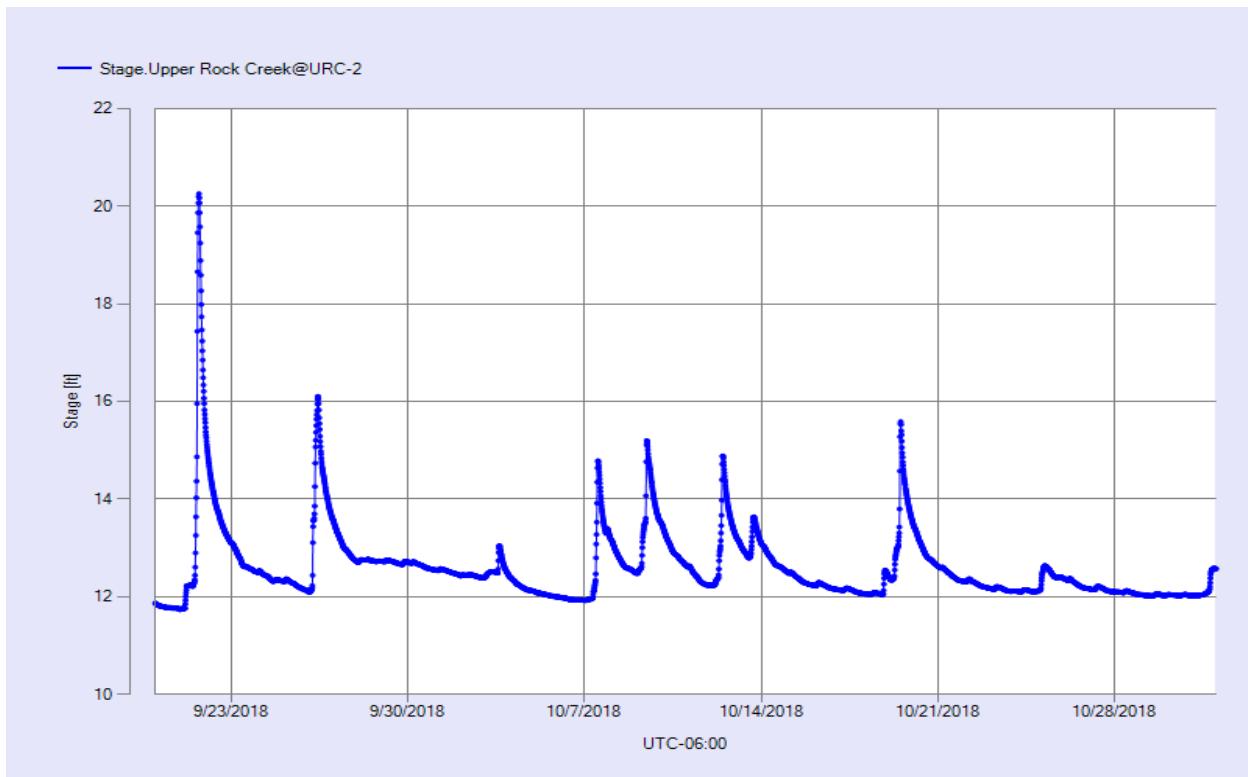


Figure 8 Monthly Hydrograph URC-2

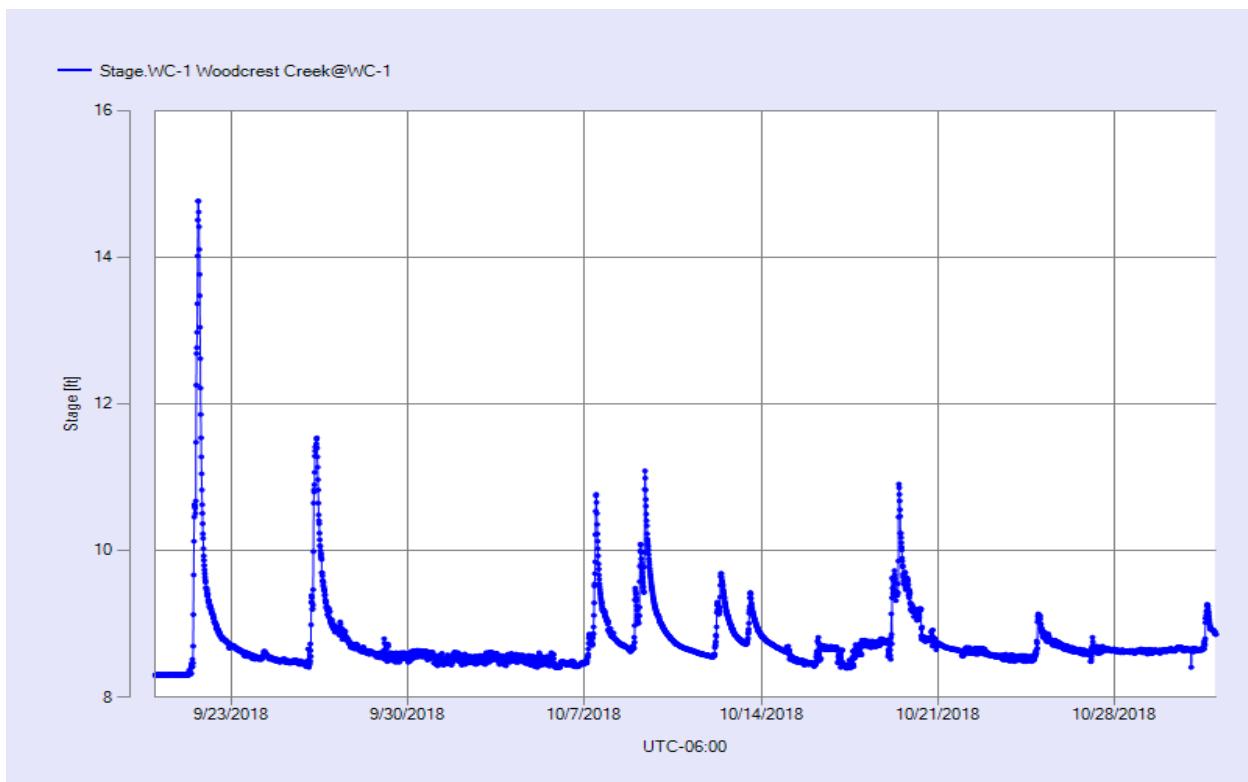


Figure 9 Monthly Hydrograph WC-1

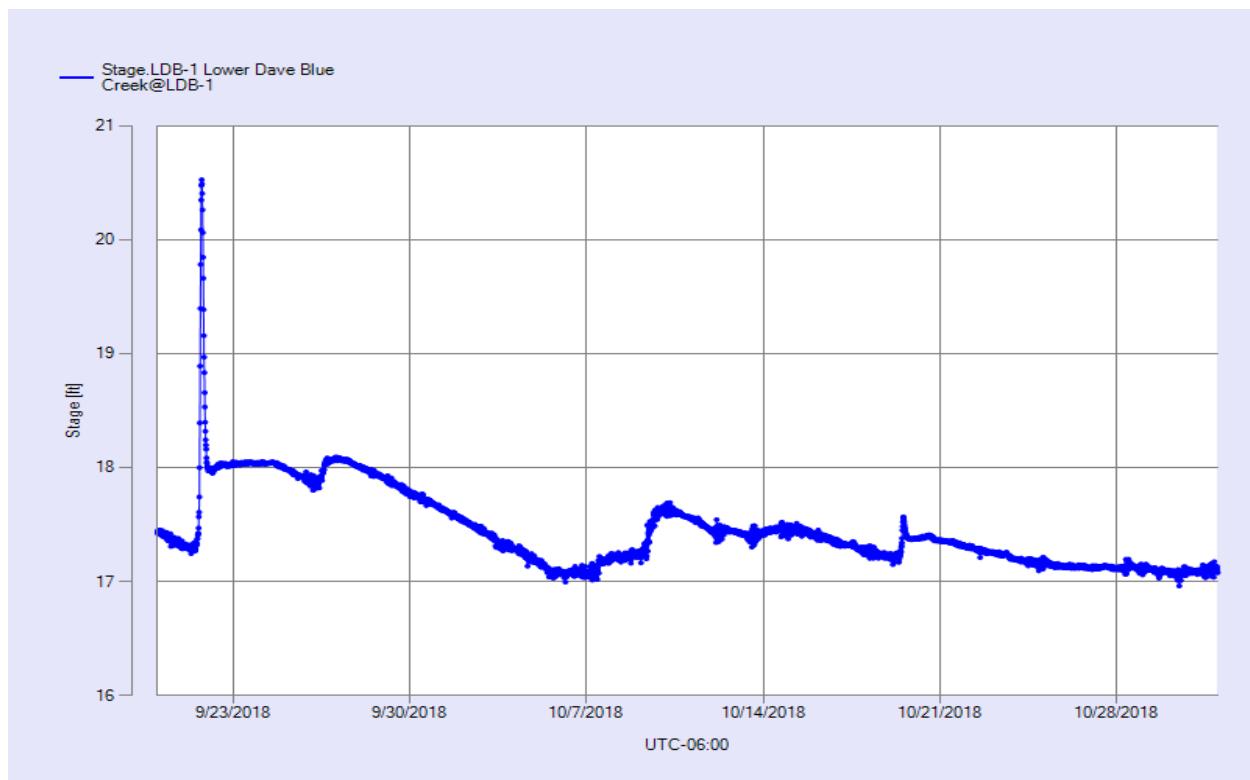


Figure 10 Monthly Hydrograph LDB-1

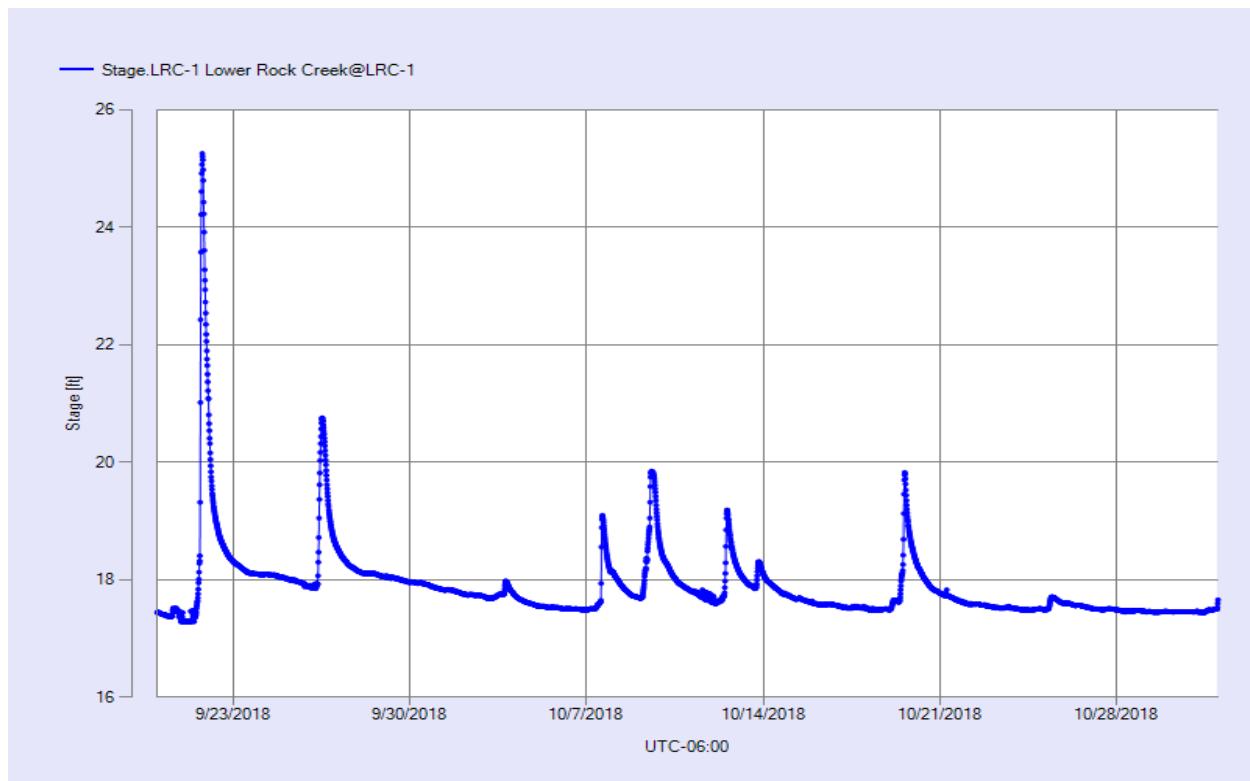


Figure 11 Monthly Hydrograph LRC-1

MESONET CLIMATOLOGICAL DATA SUMMARY (NRMN) Norman Latitude: 35-14-09								September 2018 Nearest City: 2.1 NW Norman Longitude: 97-27-53							Time Zone: Midnight-Midnight CST County: Cleveland Elevation: 1171 feet					
DAY	TEMPERATURE (°F)				DEG DAYS		HUMIDITY (%)			RAIN (in)	PRESSURE (in)		WIND SPEED (mph)			SOLAR (MJ/m²)	4" SOIL TEMPERATURES			
	MAX	MIN	AVG	DEWPT	HDD	CDD	MAX	MIN	AVG		STN	MSL	DIR	AVG	MAX		SOD	BARE	MAX	MIN
1	94	74	83.4	68.2	0	19	80	44	61	0.00	28.69	29.93	SE	8.9	22.4	24.55	81.0	87.2	95	81
2	90	72	80.7	69.7	0	16	85	54	70	0.00	28.70	29.95	SE	9.6	21.3	17.17	80.6	85.8	92	81
3	84	72	75.4	70.5	0	13	97	66	85	0.09	28.75	30.00	ESE	9.7	26.8	12.89	79.6	82.9	87	80
4	81	72	74.7	72.2	0	12	98	74	92	2.13	28.76	30.01	SSE	6.9	19.8	8.18	78.0	79.4	82	78
5	83	72	75.9	72.5	0	13	99	72	90	0.31	28.82	30.08	E	4.5	17.1	14.01	78.8	80.1	85	76
6	83	72	75.4	72.7	0	13	99	71	91	0.47	28.85	30.10	NNE	4.9	16.2	10.24	78.6	79.6	84	77
7	77*	71*	73.2*	71.7*	0*	9*	98	85	95	0.71	28.79	30.04	NNE	5.9	14.2	3.70*	77.6	77.5	79	76
8	73	64	69.8	67.2	0	4	98	80	92	0.06	28.74	29.98	NNE	9.0	18.5	6.10	76.0	75.4	77	74
9	72	60	65.4	61.1	0	1	98	67	87	0.00	28.74	29.98	NNE	6.4	17.0	9.35	74.0	72.9	76	71
10	77	55	65.4	59.8	0	1	100	59	84	0.00	28.77	30.02	E	2.9	10.7	16.22	72.3	71.5	78	66
11	82	61	71.5	64.1	0	6	100	53	79	0.00	28.79	30.04	SE	5.2	16.1	19.42	73.2	73.3	79	68
12	80*	70*	73.8*	68.5*	0*	10*	93*	68*	84*	0.00*	28.79*	30.04*	SSE*	6.7*	16.2*	NA	74.9*	74.2*	77*	72*
13	84	70	75.6	69.7	0	12	94	61	83	0.00	28.80	30.05	SSE	7.2	17.0	10.31	75.5	74.5	78	72
14	89	69	78.6	68.6	0	14	96	48	73	0.00	28.81	30.06	SSE	5.4	17.0	22.15	76.9	76.4	82	71
15	84	71	75.9	70.9	0	12	97	68	85	0.08	28.83	30.08	NE	3.0	10.0	11.96	77.7	76.6	81	74
16	88	69	78.3	70.2	0	13	99	53	78	0.00	28.76	30.01	S	3.7	14.6	19.75	78.3	77.7	83	73
17	90	68	79.9	70.5	0	14	97	51	75	0.00	28.73	29.97	SSE	4.9	15.3	17.48	78.6	78.3	83	73
18	91	72	81.1	69.7	0	16	93	49	70	0.00	28.71	29.96	S	7.0	22.1	21.27	79.2	81.3	89	74
19	91	71	81.4	68.0	0	16	89	42	66	0.00	28.68	29.93	S	7.7	23.5	22.00	79.3	83.0	90	76
20	90	73	80.2	68.3	0	16	85	50	68	0.00	28.67	29.91	S	9.0	24.6	20.43	79.2	83.2	90	77
21	73	61	68.2	65.5	0	2	98	82	91	2.63	28.78	30.03	NNE	11.5	35.2	1.66	76.4	76.4	82	71
22	72	60	65.4	59.5	0	1	88	73	82	0.00	28.83	30.08	NE	12.4	28.1	11.28	72.1	70.6	74	68
23	72	63	66.7	62.8	0	2	95	79	87	0.00	28.74	29.99	NE	6.7	16.4	8.64	72.4	70.8	74	68
24	78	67	70.0	67.5	0	7	99	74	92	0.09	28.66	29.90	SSE	3.8	13.2	8.22	73.6	72.4	76	70
25	87	66	74.1	64.5	0	11	100	42	75	0.01	28.70	29.95	SSW	9.5	28.2	20.70	74.6	73.5	79	69
26	66	50	57.4	51.2	7	0	98	50	81	1.15	28.95	30.21	NE	8.9	29.2	7.61	70.9	66.9	71	64
27	73	47	60.1	49.7	5	0	99	39	72	0.00	28.81	30.06	SSE	3.0	12.9	21.94	68.2	66.2	74	59
28	75	59	65.7	61.4	0	2	99	70	87	0.00	28.83	30.08	SSE	8.2	19.2	15.80	70.1	69.1	75	64
29	76	61	67.6	64.6	0	4	100	76	91	0.00	28.87	30.12	SSE	8.0	19.4	7.65	70.9	69.3	72	67
30	83	69	73.4	67.6	0	11	96	63	83	0.00	28.84	30.10	S	8.6	19.7	10.43	72.4	71.7	75	70
	81*	66*	72.8*	66.3*	<- Monthly Averages ->				28.77*	30.02*	SSE*	7.0*	35.2*	13.83*	75.7*	75.9*	81*	72*		
Temperature - Highest: 94* Lowest: 47*					Degree Days - Total HDD: 12* Total CDD: 270*					Number of Days With: Tmax ≥ 90: 6* Rainfall ≥ 0.01 inch: 11* Tmax ≤ 32: 0* Rainfall ≥ 0.10 inch: 6* Tmin ≤ 32: 0* Avg Wind Speed ≥ 10 mph: 2* Tmin ≤ 0: 0* Max Wind Speed ≥ 30 mph: 1*										
Rainfall: Monthly Total: 7.73* in. Greatest 24 Hr: 2.63* in.					Humidity - Highest: 100* Lowest: 39*															

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Figure 12 September Mesonet Data

* Denotes incomplete record

MESONET CLIMATOLOGICAL DATA SUMMARY (NRMN) Norman Latitude: 35-14-09						October 2018 Nearest City: 2.1 NW Norman Longitude: 97-27-53					Time Zone: Midnight-Midnight CST County: Cleveland Elevation: 1171 feet									
DAY	TEMPERATURE (°F)				DEG DAYS HDD CDD	HUMIDITY (%)			RAIN (in)	PRESSURE (in)		WIND SPEED (mph) DIR AVG	SOLAR (MJ/m²)	4" SOIL TEMPERATURES						
	MAX	MIN	Avg	Dewpt		Max	Min	Avg		STN	MSL			SOD	BARE	MAX	MIN			
1	84	69	75.0	68.4	0	11	96	59	81	0.00	28.86	30.11	SSE	7.8	18.7	14.01	73.6	73.1	78	70
2	84	68	74.8	69.1	0	11	98	64	83	0.00	28.82	30.07	SSE	8.3	22.0	15.67	74.4	73.6	78	70
3	87	71	78.4	69.0	0	14	93	54	74	0.00	28.67	29.92	S	12.2	30.3	18.66	75.0	74.2	78	71
4	87	65	77.0	68.4	0	11	94	57	76	0.00	28.72	29.97	S	7.4	22.2	15.98	75.8	75.2	80	71
5	87	65	77.3	67.7	0	11	95	53	74	0.00	28.67	29.91	S	9.3	27.0	17.51	75.6	75.9	82	71
6	76	58	67.2	62.3	0	2	97	68	84	0.23	28.71	29.96	S	9.1	24.3	10.24	74.7	73.3	76	69
7	79	59	69.0	65.5	0	4	99	71	89	1.02	28.68	29.93	SSE	7.6	26.5	10.19	72.5	70.6	75	67
8	80	67	73.9	68.6	0	9	97	67	84	0.37	28.61	29.85	SSE	9.5	26.0	9.27	73.5	73.2	76	71
9	70	58	65.5	63.8	1	0	98	86	94	0.92	28.50	29.74	S	7.9	34.6	4.21	72.1	71.0	73	69
10	62	48	54.0	46.7	10	0	93	57	77	0.00	28.72	29.97	NW	8.3	20.7	18.08	69.2	67.0	71	63
11	64	45	54.1	43.6	11	0	88	49	69	0.00	28.88	30.14	NNE	6.9	18.9	18.90	66.5	63.4	70	58
12	63	51	56.0	53.5	8	0	97	70	92	0.61	28.74	29.99	S	6.1	20.0	3.15	65.2	62.0	64	60
13	55	49	52.0	49.7	13	0	100	80	92	0.29	28.65	29.90	ENE	5.8	23.8	4.73	63.5	60.3	62	59
14	64	37	50.0	47.8	15	0	100	76	92	0.00	28.73	29.97	NNW	10.8	37.3	5.27	62.8	59.9	64	55
15	51	36	41.6	31.8	22	0	90	48	69	0.00	29.08	30.34	N	15.0	34.0	15.97	58.8	54.2	59	50
16	55*	41*	46.5*	35.7*	17*	0*	95*	43*	67*	0.00*	29.06*	30.32*	NNE*	5.3*	15.4*	NA	58.1*	52.9*	56*	50*
17	68	40	54.3	43.1	11	0	98	35	70	0.00	29.13	30.40	ENE	4.4	18.5	12.18	58.6	55.2	59	51
18	59	53	56.1	50.1	9	0	92	65	81	0.05	29.13	30.40	E	3.9	12.4	5.72	60.5	58.1	60	56
19	60	50	54.9	53.6	10	0	100	83	95	0.89	28.94	30.19	S	4.1	12.0	3.44	60.8	58.8	60	58
20	70	46	56.7	46.4	7	0	100	34	73	0.00	29.03	30.29	NNE	5.7	19.0	16.95	60.7	59.9	64	56
21	69	39	54.3	42.1	11	0	99	36	68	0.00	29.03	30.29	SSE	3.8	13.1	16.48	59.6	58.6	63	54
22	68	45	55.8	45.8	8	0	86	48	71	0.00	28.91	30.16	S	6.5	16.8	13.21	59.9	57.9	62	54
23	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00*	NA	NA	E *	NA	16.3*	NA	NA	NA	NA	
24	56	45	52.0	48.4	14	0	98	67	88	0.30	28.89	30.14	E	4.5	20.8	2.83	59.6	56.5	59	55
25	58	48	51.7	49.2	12	0	98	77	91	0.08	28.69	29.94	NW	4.4	11.7	3.76	59.2	56.7	58	55
26	72	43	54.6	47.7	8	0	100	41	81	0.00	28.70	29.95	NW	4.5	15.1	16.49	59.4	57.4	63	52
27	80	43	61.8	47.4	3	0	100	25	66	0.01	28.73	29.98	SSW	3.4	14.1	16.72	60.0	58.4	64	53
28	74	48	61.3	47.3	4	0	93	29	64	0.00	28.83	30.08	NNE	6.1	24.5	16.23	60.9	59.5	64	56
29	82	46	64.9	51.8	1	0	88	40	64	0.00	28.72	29.97	S	7.4	28.1	15.66	60.8	59.1	64	54
30	73*	55*	64.2*	55.9*	1*	0*	92*	64*	75*	0.00*	28.59*	29.83*	S *	11.5*	27.4*	NA	63.1*	62.1*	64*	60*
31	55	48	51.4	44.5	13	0	94	65	78	0.41	28.69	29.93	N	9.5	22.4	1.69	60.3	56.7	60	54
	70*	51*	60.2*	52.8*			<- Monthly Averages ->			28.80*	30.05*	S *	7.2*	37.3*	11.54*	65.1*	63.2*	67*	60*	
Temperature - Highest: 87*				Degree Days - Total HDD: 209*				Number of Days With:				Rainfall ≥ 0.01 inch: 12*								
Lowest: 36*				Total CDD: 73*				Tmax ≥ 90: 0*				Rainfall ≥ 0.10 inch: 9*								
Rainfall: Monthly Total: 5.18* in.				Humidity - Highest: 100*				Tmax ≤ 32: 0*				Avg Wind Speed ≥ 10 mph: 4*								
Greatest 24 Hr: 1.02* in.				Lowest: 25*				Tmin ≤ 0: 0*				Max Wind Speed ≥ 30 mph: 4*								

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Figure 13 October Mesonet Data

* Denotes incomplete record